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SPACE SCIENCE**

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Contract/Grant No.: Noo173-01-1-G909

Project Name: "Exploration of New Technologies
and Novel Designs to Improve X-ray
Framing Camera Performance:

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Report Preparation Date: 11/1/2002

Report Type: Final Technical Report

Period Covered: 4/20/01-10/19/02

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Distribution Unlimited

20030110 074

Final Report

**Exploration of New Technologies and Novel Designs
to Improve X-ray Framing Camera Performance**

Principal Investigator:

R. Paul Drake,
University of Michigan

November 1, 2002

Final Report

Under funding by this contract, we have accomplished the following.

We have developed and activated a facility for steady-state x-ray characterization of microchannel plates, framing cameras, and related components. We have completed a vacuum system with a Manson-type x-ray source. This required experience with and upgrading of the source in order to make it routinely operable. At this time we are able to operate it routinely and we have written manuals for its operation and maintenance by students working in our laboratory environment. The system includes an absolutely calibrated vacuum photodiode for x-ray flux measurements. Figure 1 shows an image of the source, attached to the vacuum chamber.

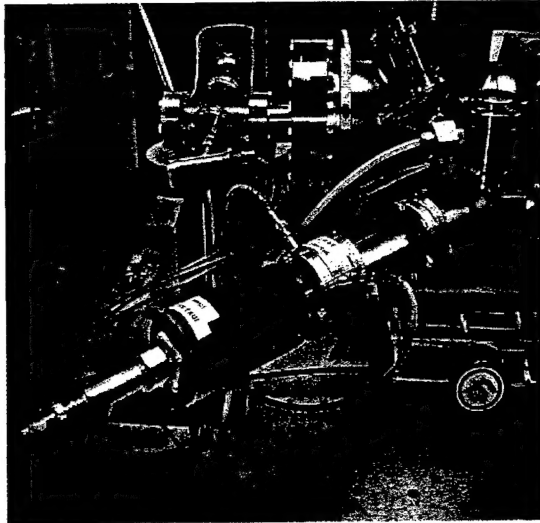


Figure 1. The x-ray source.

We have activated a micro-channel-plate mounting system, so that we can work with 2 inch microchannel plates, backed by a fiber optic faceplate with a phosphor coating. This produces data as shown in Figure 2, obtained by recording the emission from the phosphor with a lens-coupled CCD system. This can be seen in figure 3. The x-ray spot, in the present system, does not fill the 2-inch plate, but this is not necessary for the intended studies of efficiency and noise. We have designed and are now implementing an adapter to our mount, to allow us to work with 1-inch microchannel plates.

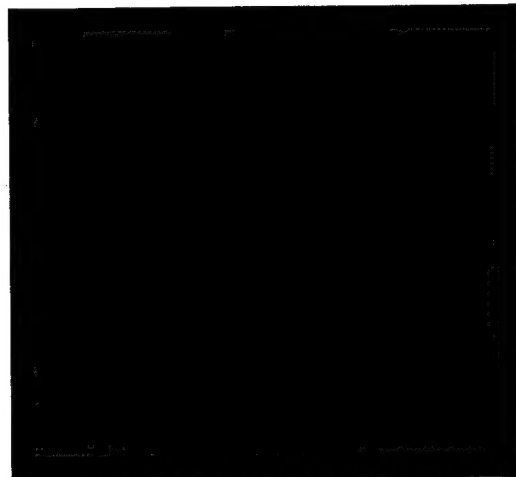


Figure 2. Signal from x-ray source through channel plate and phosphor.

We have begun using this system to characterize a number of plates we purchased having a variety of bias angles and coatings. We have also worked on calculating the variation with bias angle in the behavior of channel plates

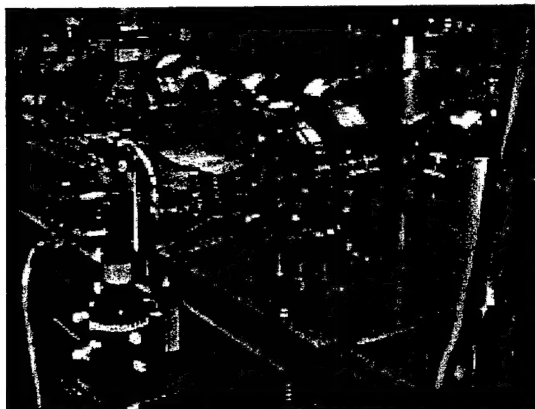


Figure 3. The lens-coupled CCD system, the phosphor, and the vacuum chamber are visible in this photograph.

used to for imaging, as opposed to pulse counting, which is treated in the literature.

In the process of getting to this point, we have assembled or purchased a number of other facilities including a hood under which to work on these systems, a nitrogen dry box for storage, and a nitrogen system for venting from vacuum.

We also accomplished a number of related activities. We did some preliminary work with a multiple-diode system that can be used to evaluate various potential photocathode materials. We obtained schematics and did some planning associated with pulsing of the x-ray source. We did extensive literature searching related to photoelectric quantum efficiency and the effect of electric fields on this. In addition, we sent two students to NRL to work with NRL researchers on x-ray facilities and diagnostics at NRL.

We are presenting the results of our work to date at the APS/DPP meeting in November of 2002.

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
<small>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.</small> PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.				
1. REPORT DATE (DD-MM-YYYY) 1-11-2002		2. REPORT DATE		3. DATES COVERED (From - To) 20 Apr '01 - 19 Oct '02
4. TITLE AND SUBTITLE Exploration of New Technologies and Novel Design to Improve X-Ray Framing Camera Performance		5a. CONTRACT NUMBER 20 APR		
		5b. GRANT NUMBER N00173-01-1-G909		
		5c. PROGRAM ELEMENT NUMBER N/A		
		5d. PROJECT NUMBER F004612		
6. AUTHOR(S) R. Paul Drake		5e. TASK NUMBER N/A		
		5f. WORK UNIT NUMBER SPRL 224500		
		8. PERFORMING ORGANIZATION REPORT NUMBER N/A		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) UofM/DRDA 1058 Wolverine Tower 3003 South State Street Ann Arbor MI 48109-1274		10. SPONSOR/MONITOR'S ACRONYM(S) NRL		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Research Laboratory-SSC Code 3235 Stennis Space Center, MS 39529-5004		11. SPONSORING/MONITORING AGENCY REPORT NUMBER Code 3235		
12. DISTRIBUTION AVAILABILITY STATEMENT Unlimited				
13. SUPPLEMENTARY NOTES N/A				
14. ABSTRACT See attached report				
15. SUBJECT TERMS				
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES
a. REPORT	b. ABSTRACT	c. THIS PAGE		
				19a. NAME OF RESPONSIBLE PERSON
				19b. TELEPHONE NUMBER (include area code)